

REMARKS

With claims 1, 42, 45-50, 53 and 57 pending, with this amendment claims 1, 53 and 57 have been amended.

Objection to Specification

The specification stands objected to as failing to provide antecedent basis for claimed subject matter. In particular, the Office Action indicates that claim 53, lines 3-5, “wherein the hard mask remains substantially unexposed to a gas for lowering at least one of its sputtering yield or erosion rate,” and in claim 53, lines 6-8 “allowing the patterned hard mask to react with the etch process gases mixed together in order to lower at least one of the sputtering yield and erosion rate of the hard mask and to etch the layer corresponding to the pattern of the hard mask” are not supported by the specification, which fails to disclose the process gasses.

In response, claim 53 has been amended as shown above to initially indicate that a “hard mask material” is deposited and patterned and “is exposed to a hardening gas for lowering at least one of its sputtering yield or erosion rate.” Then the “patterned hard mask material” is exposed to a “hardening gas” that is “mixed together” with “etch process gasses” in order to further lower the sputtering yield or erosion rate.

Portions of applicant’s specification that provide support this claim language are identified as follows: Page 9, lines 6-11 of the specification indicate that the hard mask is formed by “exposing the reactive metal to a stream of oxygen, nitrogen ... either prior to or during the etch process.” Page 10, beginning at line 14 states “adding oxidants such as oxygen to the process gas and in particular with respect

to a hard mask comprises of titanium or aluminum cause the formation of an oxide on the hard mask resulting in less erosion of the hard mask and a minimization of the critical dimension growth.” Page 11, beginning on line 1 indicates “the hard mask selected from a reactive metal or selected from an appropriate oxide, nitride, fluoride ... has a favorably low sputter yield ...”

Based on the above amendments and remarks, Applicants now believe that antecedent basis is provided in the specification for claim 53. Accordingly, Applicants request that the objection to the specification be withdrawn.

Section 112, First Paragraph, Rejection

Claims 53 and 57 stand rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification. The Office Action refers to the language in claim 53 objected to above in the objections to the specification. Based on the amendments to claim 53 and the remarks provided above in response to the specification objection, Applicants maintain that the present application is allowable under 35 U.S.C. § 112, first paragraph.

Section 112, Second Paragraph, Rejection

Claims 53 and 57 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Regarding claim 53, the Office Action states that “allowing the patterned hard mask to react with the etch process gases mixed together” is indefinite because it is unclear whether “the etch process gases” comprise one gas or more than one gas. In response to this rejection Applicants have amended the term “etch process gases” to be “etch process gas” to provide antecedent basis to the term gas elsewhere in claims

53 and 57. Applicant maintains that “gas” claimed can be a single gas element or multiple gas elements mixed under the meaning now claimed, the amendment being made only for purpose of maintaining consistency in the claim for clarity.

Regarding claim 57, the Office Action states that “wherein the etch process gases comprises a gases...” is indefinite because like claim 53 it is unclear whether the “the etch process gases” comprise one gas or more than one gas. As with claim 53, claim 57 has been amended to change the term “gases” to “gas” to comply with the remaining claim language. As indicated above, the amendment was done for clarity and the term “gas” claimed can be a single gas element or multiple gas elements.

Based on the above amendments and remarks, claims 53 and 57 are now believed in condition for allowance under 35 U.S.C. § 112, second paragraph.

Section 102/103 Rejection

Claims 1, 42, 45-50, 53 and 57 stand rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Fujii et al. (US 5,170,231)(hereafter Fujii). The Office Action states Fujii teaches “Then, the entire surface of the p-SiC single-crystal layer 32 was covered with an aluminum film 37 by vacuum deposition, followed by patterning with the use of photolithography. Using the patterned aluminum film (same as applicants’ hard mask comprising a reactive metal and being substantially unoxidized) 37 as a mask, a predetermined portion of the p-SiC single-crystal layer 32 and n-SiC single-crystal layer 31 was etched down to the depth of about 5 um by a reactive etching technique, as shown in Fig. 3C. As the etching gases, tetrafluoromethane (CF₄) and oxygen (O₂) were used. (Column 9, lines 40-49).” The Office Action indicates that these portions of Fujii read on

Applicant's claims. Based on the above amendments and the following remarks, this rejection is believed to be overcome.

Claim 1, as amended recites "exposing the workpiece to oxidizing gas prior to exposure to an etchant in order to expose the hard mask to the oxidizing gas and form an oxide skin on the exposed surface of the hard mask." This contrasts with Fujii where the oxidizing gas is mixed with the etchant. Fujii does not disclose exposure of the hard mask material to oxygen prior to etching. Claim 1, as amended, is therefore believed allowable as not anticipated by Fujii. Without disclosing all of the subject matter now claimed, Fujii likewise is not believed to render claim 1 obvious.

Claims 42 and 45-50 are believed allowable as not anticipated and non-obvious over Fujii based at least on their dependence on claim 1. Claim 53 has been amended, similar to claim 1, to indicate that the hard mask material is exposed to an hardening gas prior to exposure to an etchant. Accordingly, claim 53 is likewise believed as allowable as not anticipated or non-obvious over Fujii. Claim 57 is believed allowable based on its dependence on claim 53.

Conclusion

In light of the above amendments and remarks, claims 1, 42, 45-50, 53 and 57 are all believed in condition for allowance. Accordingly, reconsideration and allowance of these claims is respectfully requested.

No fee is believed due with this response. Should a fee be due, the Commissioner is authorized to charge any underpayment to Deposit Account No. 06-1325.

Respectfully submitted,

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